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MERCURY LEVELS IN AMBIENT AIR NEAR CANADIAN INDUSTRIES LIMITED (CIL) CORNWALL, ONTARIO SEPTEMBER, 1986

ARB-095-87-AQM

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Ontario

Ministry of the Environment

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Air Resources Branch

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Mercury Levels in Ambient Air near Canadian Industries Limited (CIL) Cornwall, Ontario September, 1986

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Prepared for

The Southeastern Region

Ministry of the Environment

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EXECUTIVE SUMMARY

An air quality survey in Cornwall in September 1986 determined the ambient air concentrations of mercury in the vicinity of the CIL chlor-alkali plant.

The Ontario ½-hour standard for mercury of 5.0 ug/m^3 was not exceeded at any time. The largest ½-hour average concentration was 1.32 ug/m^3 in the CIL parking lot just 60 metres from the mercury cell room. The other locations and results are highly similar to the results of a previous study in 1984 when the maximum ½-hour concentration was 0.7 ug/m^3.

RÉSUMÉ ADMINISTRATIF

On a effectué à Cornwall en septembre 1986 une étude de la qualité de l'air qui portait sur la concentration de mercure dans l'air près de l'usine de chlore et d'alcalis CIL.

La limite fixée par l'Ontario pour le mercure pour une période de trente minutes, soit 5,0 ug/m^3, n'a pas été dépassée au cours de l'étude. La plus forte concentration moyenne pour une période de trente minutes, soit 1,32 ug/m^3, a été mesurée dans le parc de stationnement de l'usine, à 60 mètres du local contenant les cellules de mercure. Les autres emplacements et résultats des mesures sont très voisins de ceux d'une étude effectuée en 1984 où la concentration maximale pour une période de trente minutes était de 0,7 ug/m^3.

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Executive Summary

1.0 Introduction

At the request of the Southeastern Region a mobile air monitoring unit (MAMU #2) from the Air Resources Branch performed an ambient air quality survey in Cornwall during the period September 3 to September 18, 1986. The survey objective was to determine the ambient air concentrations of mercury (Hg) in the vicinity of the chlor-alkali plant operated by Canadian Industries Limited (CIL).

There is concern over the continuing problem of elevated mercury levels in the soil and residential garden produce near the CIL plant. A previous study in October 1984 had determined the maximum ½-hour average concentration of mercury in ambient air near the plant to be 0.7 ug/m^3, 14% of the Ontario standard (5.0 ug/m^3). The present study was necessary to assess compliance with the standard and provide more data for further evaluation of the problem.

2.0 MAMU #2 and Survey Technique

MAMu #2 contains analyzers for monitoring of carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide (NO_2), methane (CH_4) and non-methane (TH-M) components of total hydrocarbons (THC), Ozone (O_3), sulphur dioxide (SO_2), total reduced sulphur (TRS) including hydrogen sulphide (H_2S), and elemental mercury (Hg).

The mercury analyzer is a modified Scintrex HGP-2 mercury spectrometer, which uses the Zeeman effect to produce a dual wavelength radiation beam - an analytical wavelength for the mercury measurement and a slightly displaced reference wavelength for all other compounds which absorb radiation in that part of the ultra-violet spectrum. The instrument uses a long pathlength sample cell and was specially designed to provide high sensitivity for mercury (detection limit of around five nanograms (10^{-9}g) of

elemental mercury per cubic meter of air) at a response time of a few seconds. Any mercury adsorbed to airborne dust particles was blocked by an in-line dust filter and not measured.

Simultaneously with air sampling, meteorological conditions were monitored including wind speed and direction; temperature, barometric pressure, relative humidity and solar radiation.

The operational procedure was to calibrate the instruments each morning at the filtration plant about 0.3 km west of CIL on Second Street before checking the wind direction and moving downwind of the mercury cell room at the CIL plant. Monitoring periods were at least 30 minutes long, and more than one hour whenever feasible.

3.0 Results and Discussion

Table 1 lists the monitoring periods chronologically and the precise location for each sampling site, along with a summary of the results for mercury. Figure 1 is a map of the area with the monitoring locations marked by an "x" and the maximum Hg concentrations (½-hour ave.) noted nearby.

Mercury concentrations downwind of CIL did not exceed 2.5 ug/m^3 for a short-term peak (1-minute average). The ½-hour Ontario standard of 5.0 ug/m^3 was not exceeded during the survey; the largest ½-hour average concentrations were 1.32 ug/m^3 and 1.13 ug/m^3, both in the CIL parking lot 60 meters north-east of the mercury cell room. The other locations and results are highly similar to those of the 1984 survey when the maximum ½-hour average concentrations were around 0.7 ug/m^3.

The arithmetic mean levels of mercury represent an average value for the entire period listed and serve only to give some impression of the average levels of mercury in the ambient air over a longer period.

4.0 Conclusion

The largest peak (1 minute average) concentration of mercury was 2.5 ug/m^3 and the largest ½-hour average was 1.32 ug/m^3 - less than the ½-hour Ontario standard of 5.0 ug/m^3. With the exception of the locations in the CIL parking lot, which were not used in the 1984 survey but gave the highest readings in this survey, the locations and results are highly similar to those of the 1984 survey when an maximum ½-hour average of 0.7 ug/m^3 was found.

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Table 1

Summary of Locations and Results

Time	Location	Mercury (Hg) - ug/m³ max. ½-hr	peak (1-min)	Arith mean	Temp(°C)	WS/ WD*
Sept. 03 12:30-16:10	Filtration Plant 0.3 km W of CIL	0.44	1.20	0.21	18	12/065
Sept. 03 16:27-09:55	same as above	0.50	0.69	0.10	17	12/070
Sept. 08 16:44-18:00	CIL park lot, 60 m NE cell room	1.32	2.30	1.16	17	10/210
Sept. 08 18:15-18:47	Brookdale Ave. at CIL office	0.43	1.09	0.42	18	9/190
Sept. 09 13:37-14:42	27 Gulf St., 30 m S 4th St.	0.77	1.33	0.63	25	8/245
Sept. 09 15:38-16:47	4th St. 100 m E Gulf St.	0.37	0.83	0.33	23	13/220
Sept. 10 11:40-14:10	Edythe Ave. at E end	0.08	0.24	0.05	18	3/120
Sept. 10 14:55-08:20	Filtration Plant	-	-	-		
Sept. 16 13:18-14:00	CIL fenceline near 2nd St. exit	0.36	0.74	0.30	14	14/325
Sept. 17 10:17-13:30	CIL park. lot, 60 m NE cell room	1.13	2.50	0.74	12	6/215
Sept. 17 13:45-15:05	Brookdale Ave. 50 m N CIL exit.	0.63	1.65	0.45	14	6/235
Sept. 17 15:53-16:41	Filtration Plant (upwind)	0.03	0.06	0.02	17	5/220
Sept. 18 10:00-11:16	7th St. at Brookale Ave.	0.04	0.08	0.01	18	9/187
Sept. 18 13:59-15:03	3rd St. at Brookdale Ave.	0.30	0.92	0.27	18	7/250

*WS = wind speed (km/hr)
WD = wind direction (from); north is 0° or 360°

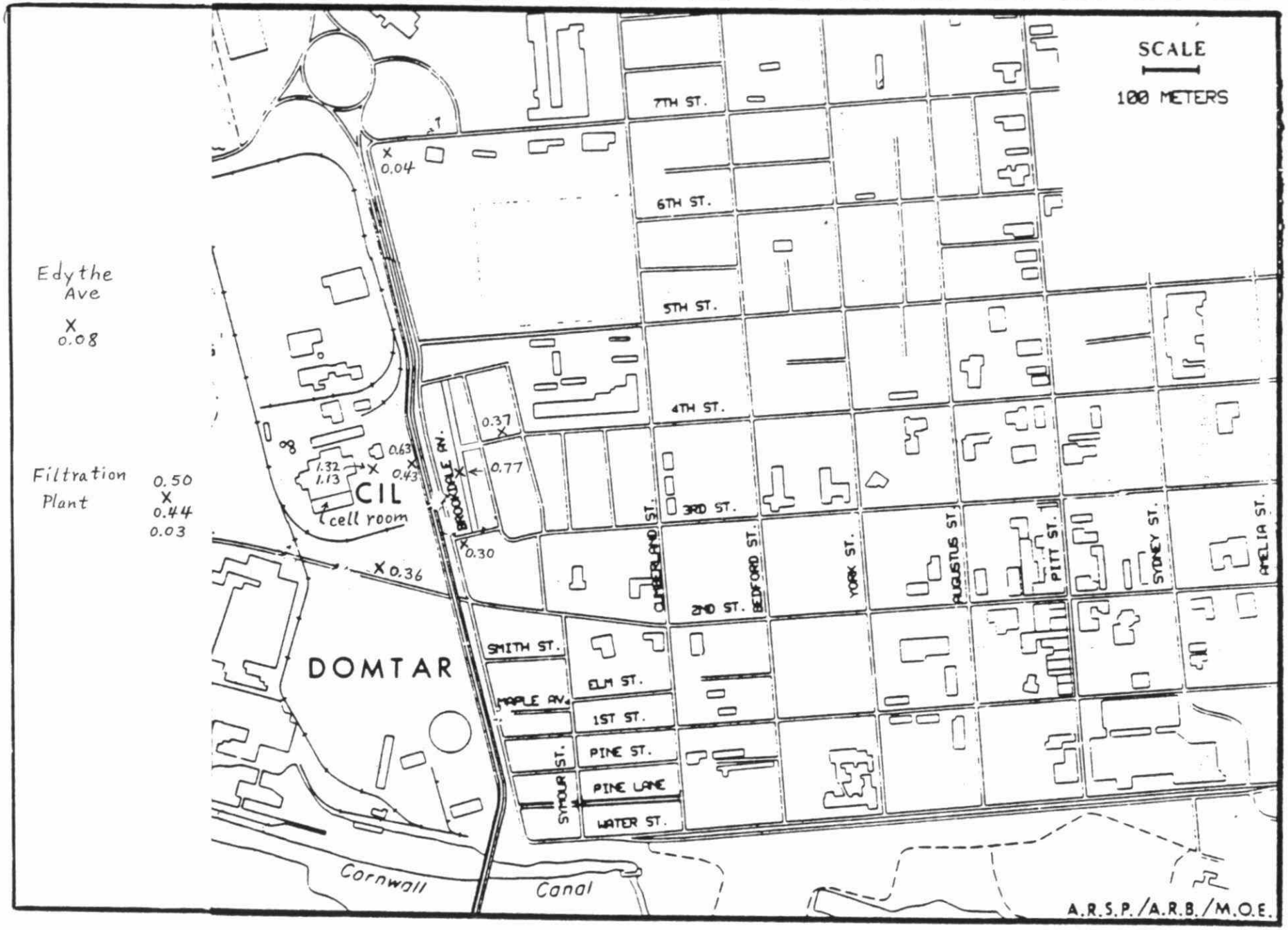

Figure 1. Monitoring Locations for MAMU #2(x); Hg concentrations in ug/m^3.